

**Building the Next Generation of Scientific Explorers through Active Engagement with STEM Experts and International Space Station Resources.** P.V. Graff<sup>1</sup>, W. L. Stefanov<sup>2</sup>, L. Vanderbloemen<sup>1</sup>, M. Higgins<sup>1</sup>, E. Rampe<sup>3</sup>, <sup>1</sup>Jacobs @ NASA Johnson Space Center, Houston, TX, 77058, ([paige.v.graff@nasa.gov](mailto:paige.v.graff@nasa.gov)), <sup>2</sup>NASA JSC, <sup>3</sup>Aerodyne – Jacobs JETS Contract, NASA JSC.

Connecting students and teachers in classrooms with science, technology, engineering, and mathematics (STEM) experts provides an invaluable opportunity for all. These experts can share the benefits and utilization of resources from the International Space Station (ISS) while sharing and “translating” exciting science being conducted by professional scientists. Active engagement with these STEM experts involves students in the journey of science and exploration in an enthralling and understandable manner. This active engagement, connecting classrooms with scientific experts, helps inspire and build the next generation of scientific explorers in academia, private industry, and government.

The Expedition Earth and Beyond (EEAB) Program is an Earth and planetary science education program designed to inspire, engage, and educate teachers and students. EEAB provides resources, activities, and opportunities that allow classrooms to get actively involved with NASA exploration, discovery, and the process of science. The program, facilitated by the Astromaterials Research and Exploration Science (ARES) Division at the NASA Johnson Space Center, primarily utilizes the Crew Earth Observations (CEO) payload and imagery as a hook to motivate student learning. The Gateway to Astronaut Photography of Earth website (<http://eol.jsc.nasa.gov>) houses millions of CEO images taken by astronauts using digital hand-held cameras from the International Space Station (ISS). This site receives millions of hits per month, indicating the excitement generated by the public in viewing these images. EEAB uses astronaut photographs provided by the CEO payload as the premise of developed activities, resources, and program components promoting student-led research in grades 5-12. Over the last few years, EEAB has also provided virtual access to STEM experts and ISS resources through classroom connection webinars. These webinar connections, growing in interest and participation each year, have become increasingly effective in being able to reach out and involve classrooms across the nation with STEM experts and the use of ISS resources.

Classroom connection webinars are online distance learning events designed to connect distributed participants (students and teachers) and allow them to be actively engaged as they interact with STEM experts. Events are facilitated through the use of WebEx, a web-based collaborative tool. Technical requirements are minimal -- an internet-connected computer and a speaker phone. Participants have utilized SKYPE or Google Voice as speaker phone alternatives. Expedition Earth and Beyond classroom connection webinars generally focus on a broad range of topics such as Earth observations, remote sensing, comparative planetology, and/or planetary exploration. The interactive nature of the webinars enables event facilitators to ask students questions to gain insight into their prior knowledge, to gauge their understanding, and to

help keep students engaged throughout the event. At the end of each ~45 minute interaction there is time allotted for students to ask questions. For those interested, an optional extended question and answer session is provided. As these webinars are available to classrooms across different time zones, sessions are offered on two different days and at different times in order to accommodate the interest and availability of participants. For those who may be unable to participate in a live event, event archives are available.

These virtual connections help enhance participants' understanding of the value of work being done from the unique platform of the ISS. They also provide an opportunity for students to engage and interact with ISS scientists and STEM role models. Additionally, these events are designed to help teachers address concepts and content standards they are required to teach. Teachers learn how to integrate data and imagery obtained through the ISS to help promote scientific thinking, help students observe and conduct investigations focusing on our changing planet, and help students consider how these data can be used to better understand or investigate other planetary worlds such as Mars. Webinars that focus on Earth/Mars comparisons allow students to see the value in data obtained from the ISS and how that can be useful as a basis of understanding Mars. This is especially useful as NASA embarks on the journey to Mars and beyond.

Since 2009, Expedition Earth and Beyond classroom connection webinars have reached over 15,000 participants in 40 states. Post-surveys about the events have indicated an overwhelmingly positive response to the webinars. Survey comments include: *"We thoroughly enjoyed this experience. The opportunity to engage with a real scientist working in such a thrilling capacity is immeasurable."*; *"What made this presentation particularly effective was the interactive nature of it. The moderator did an excellent job of making the students feel connected with the scientist and thereby with the science."*; *"The students loved the fact that their questions were being answered and shared with other schools."*; *"These experiences motivate our students, promote their curiosity, and help them understand the bigger picture of science."* Overall feedback from participants has indicated that these events are exciting, inspiring, motivating, and extremely valuable experiences. Students and teachers continue to ask for more webinars.

Engaging students and teachers with STEM experts highlights the ISS and its unique datasets (such as astronaut photography) to inspire, engage, and educate students and teachers. Webinar events enable the excitement and story of science and exploration to come to life in classrooms across the nation. These virtual events capture participants' attention while increasing their science awareness, providing them access to STEM experts, and reinforcing Next Generation Science Standard concepts. Classrooms no longer have to simply read about science in a textbook or from the internet; webinars enable classrooms to interact with, engage in, and become part of the journey of science and exploration as they prepare to become the next generation of scientific explorers and science professionals.